DOCUMENT RESUME

ED 318 936 CG 022 482

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TITLE An Examination of the Relationship between Critical Thinking and Academic Success on a University Campus.
PUB DATE 89
NOTE 30p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Cognitive Style; College Students; *Critical Thinking; *Grade Point Average; Higher Education; *Sex Differences

ABSTRACT

This study examined the relationship between the ability to think critically and the academic performance of undergraduate students. Male (N=107) and female (N=130) undergraduates completed a consent form, demographic sheet, and the Watson-Glaser Critical Thinking Appraisal (WGCTA), which consists of five subtests (Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments). In general, the results showed that students who obtained higher total WGCTA scores also had higher cumulative grade point averages (GPAs). The results seem to indicate the not all aspects of the ability to think critically contribute equally to overall academic performance. Although the abilities to accurately infer, interpret, and evaluate arguments were found to significantly correlate with cumulative GPA, only the abilities to infer and evaluate arguments significantly and uniquely contributed to 9.2% of the variance within cumulative GPA. Gender differences were also found. Findings appear to indicate that proficiency in only one skill (inference) associated with critical thinking was required for higher male student academic achievement, while proficiency in both deduction and evaluation of arguments was required for higher female student academic achievement. These findings suggest that what is required for a male student to succeed academically is quite different from what is required for a female student to achieve, even in cases where ability levels are quite similar. (NB)

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ED318936

An Examination of the Relationship Between Critical Thinking and Academic Success on a University Campus

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Introduction

Thinking is a mental umbrella where critical thinking is one aspect of it (Byrne and Johnstone, 1987). The ability to think critically, typically encompasses four higher level thinking skills: information analysis, information synthesis, application of material processed and information evaluation (Wilson, 1988). Having been perceived as one of the oldest and most generally recognized approach to skills links to intelligence (Begg, 1987; Petulla, 1985; Donald, 1985; O'Reilley, 1985), it is no surprise that several authors purport that diminished ability in this area directly influences the capacity for individuals to advance in effectively applying the information to which they have been exposed (Glaser, 1985; Primack, 1985-86). Ryder (1986) stated that only individuals who are proficient in such skills have the capacity for continued growth. Many consider the teaching of such skills to be imperative during this Information Age characterized with its knowledge explosion (Caissy, 1986; Keeley and Browne, 1978). For our future's sake, it would seem important to not only learn to think critically (Proefriedt, 1978), but to teach critical thinking to others as well (Beyer, 1987b; Brown, 1987; Gough, 1979; Straphan, 1986; Wilson, 1988).

As a result of the current emphasis on this acquired ability, critical thinking is also considered as an educational ideal or the central ideal of all educational endeavors (Browne and Litwin, 1987; Harris, 1986; Nelson, 1986; Norris 1985; Siegal, 1980; Siegal, 1987). Such consideration is supported by the research findings indicating a direct link between critical thinking and the following: reflective thinking and the ability to empathize (Garver, 1986); the ability to accurately evaluate situations/ information (Tanner, 1986); self-fulfilling and morally satisfying life (Sharp, 1987); awareness and personal meaning (Vandergrift, 1987); and the ability to problem-solve (Wolf, 1987). The necessity of acquiring such skills would seem imperative at all levels of education, from elementary to higher education (Annis and Annes, 1979; ~~Blain, 1987;~~ Fiere, 1987; Furedy and Furedy, 1979; Morante and Ulesky, 1984; Walters, 1987).

The purpose of the present study is to examine the relationship between the ability to think critically and the academic performance (as indicated by current cumulative GPA) of undergraduate students at a large midwestern state university. Gender differences will also be considered in the analysis of the data.

METHODS

Participants:

The participants of this study are 237 predominantly white male (n=107) and female (n=130) undergraduate students participating voluntarily drawn from the University of Kansas in Lawrence (Kansas) population (n=26,804), a Midwestern University. The selection of college students to participate in this study is due to the following reasons. The first reason is that the Watson and Glaser Critical Thinking Appraisal has been normed on a variety of population among them were college students. The second reason is that college education as an avenue toward the world of work is highly valued globally. Therefore, it is considered very important in the academic and occupational environment. This supported by Watson and Glaser (1980) who stated that: "The ability to think critically is generally regarded as a major goal of academic instruction. It is also known to play an important role in many kinds of occupations, particularly those in which careful, analytical thinking is an essential part of the job" (p. 1). A third reason is that since critical thinking skills and techniques are highly demanded in the American research as it has been indicated earlier, the researcher believed that it

is best to assess it at the university level rather than lower educational levels due to being considered as a high cognitive and social ability. Furthermore, the assessment of this construct at the college level might have an implication for developing this ability early in the educational program of children so that they could develop these critical thinking skills for their college education and life skills.

Instruments:

The instrument that is employed in this study is the WGCTA, along with the identification of current cumulative GPA, and a host of other demographical measures (including sex, academic status, and racial/ ethnicity status).

The WGCTA was designed by Goodwin Watson and Edward M. Glaser (Watson and Glaser, 1980) and is considered to be "the most widely used measure of critical thinking abilities, at least in terms of the citations in the professional literature" (Landis and Michael, 1981, p. 1156). The test is a pencil-and-paper objective instrument and has been normed on students from the ninth grade through the senior year in college (Landis and Michael, 1981). The test has two Forms A and B. "These new forms, like their predecessors Am, Ym, and Zm, measure some of the important abilities involved in critical thinking" (Watson and Glaser, 1980, p. 1).

Forms A and B are revisions of Forms Ym and Zm and differ from them in the following aspects: "Whereas Forms Ym and Zm are the earlier edition, since they relate to passages drawn from Forms Ym and Zm. there are 26 items accompanied with their passages have not been derived in any sense from Ym or Zm. In fact, they were part of a pool of items that were prestandardized or tried out in prestandardization testing. "All passages and items, whether derived from previous forms or entirely new, were thoroughly examined for reading difficulty using three indices: The Dale-Chall, the Fly, and the Flesch. Sections of the test that exceeded a ninth-grade reading level were either modified or were eliminated. As a result, Forms A and B are deemed appropriate, in terms of reading difficulty, for use with most persons who have the equivalent of a ninth-grade education" (Watson and Glaser, 1980, p. 1).

Form A of the WGCTA will be used in this study. It consisted of five subtests:

Test 1. Inference. Discriminating among degrees of truth or falsity of inferences drawn from given data.

Test 2. Recognition of Assumptions. Recognizing unstated assumptions of presupposition in given statements or assertions.

Test 3. Deduction. Determining whether certain conclusions necessarily follow from information in given statements or premises.

Test 4. Interpretation. Weighing evidence and deciding if generalizations or conclusion based on given data are warranted.

Test 5. Evaluation of Arguments. Distinguishing between arguments that are strong and relevant and those that are weak and irrelevant to a particular question at issue (Watson and Glaser, 1980, p. 2).

These five subtests were presented in an exercise-format which include problems, statements of arguments, and interpretations of data similar to those encountered at work, in the classroom, and newspapers and magazine articles on a daily basis. The WGCTA requires responses to different types of item content. Items having neutral content addressed topics such as the weather, scientific facts or experiments, and other subject matter about which people generally do not have strong feelings or prejudices. Items having controversial content, although approximately parallel in logic structure to neutral items, addressed political, economic, and social issues that frequently provoke very strong feelings" (Watson and Glaser, 1980, p. 2).

A demographic sheet requested participants' GPA, gender, academic status, and race/ethnicity.

Procedure:

The participants in this study were contacted through the psychology and communication departments in which they were drawn from research participation pools.

The investigator hung sign-up sheet(s) in places identified by both departments where participants signed up voluntarily. The sign-up sheets included such items as the time of testing, the place of testing, and the duration of testing.

Each participant received a research packet which included: a consent form, a demographic sheet and the WGCTA. The WGCTA (a paper-pencil instrument), included five scales. All data was kept confidential and safely stored.

Methods of Analysis

Several items on the WGCTA were reversed in order to maintain consistency of direction with the rest of the scale. Criterion for acceptance of a significant result was set at .05 probability level.

Stepwise multiple regression was used to identify which of the five critical thinking subscales (components or tests) best predicted GPA. Furthermore, the Pearson correlation coefficients were calculated to examine first order relationships among variables.

Results

The sample of this study consisted of 237 participants, 45.1% (N=107) males and 54.9% (N=130) females. Participants were enrolled in undergraduate course in both the departments of communication and psychology at a large midwestern state university. The mean age was 19 years old and consisted of 210 Caucasians (89.7%), 10 African Americans (4.3%), 3 Asian American (1.3%), 4 American Indian (1.7%), 7 Hispanic American (3%), and 0 International students.

Table 1 presents the composition of the sample by race/ethnicity, gender, and academic status. Most of the students were Caucasian and freshmen.

Table 2 presents a correlation matrix indicating the relationships between WGCTA subscale scores and cumulative GPA and gender. To calculate correlation coefficients with gender males were coded as 1 and females as 2. Cumulative GPA was found to significantly ($p<.05$) correlate with the following: Test 1 (the ability to make accurate inferences) ($r=.2755$); Test 4 (the ability to make accurate interpretations) ($r=.1780$); Test 5 (the ability to accurately evaluate arguments) ($r=.1285$); and the total WGCTA score (the overall ability to think critically) ($r=.2625$). Results indicate that those students who are able to make

accurate inferences, interpretations, and evaluate arguments also had higher cumulate GPAs. Overall, those students who obtained higher total WGCTA scores also had higher cumulative GPAs. It would appear that those who were better able to think critically had also obtained higher GPAs.

Gender was found to be significantly ($p<.05$) and negatively correlated with Test 4 (the ability to make accurate interpretations) ($r=-.1788$) indicating that males had higher ability in this area than females. Table 3 shows the results of multiple regression analysis with cumulative GPA as the dependent variable and the WGCTA sub-scale scores as independent variables. Test 1 (inference) and Test 5 (evaluation of arguments) were found to be the only significant predictors of cumulative GPA ($F=11.25$; $p=.0000$). The ability to infer and to evaluate arguments were found to account for 9.2% of the variance in cumulative GPA.

Table 4 presents the results of a multiple regression analysis with the males' cumulative GPA as the dependent variable and the WGCTA subscale scores as the dependent variables. Test 1 (inference) was found to be the only significant predictor of cumulative GPA for males ($F=13.45$; $p=.0004$). The ability to infer was found to account for 11.9% of the variance in cumulative GPA for male students.

Table 5 presents the results of the multiple regression analysis with females' cumulative GPA as the dependent variable and the WGCTA subscale scores as the independent variables. Test 3 (the ability to make accurate deductions) and Test 5 (evaluation of arguments) were found to be the only significant predictors of cumulative GPA for females ($F=7.67$; $p=.0007$). The abilities to make accurate deductions and evaluate arguments were found to account for 11.26% of the variance found in cumulative GPA for female students.

Discussion

The findings of the present study appear to be supported by the majority of earlier studies in the literature linking critical thinking ability with academic performance (Cabrera, 1982; Elrod, 1979; Garett, 1978; Garett and Wulf, 1978; Little, 1972; Mckinnon, 1987; Sperry, 1976; Steele-Hanson, 1986; Tilson, 1986; Young, 1986). Most importantly several of those studies have found significant relationships between the WGCTA and academic performance. Wilson and Wagner (1981) found WGCTA scores to be significantly correlated with the grades of undergraduate university students enrolled in a specially designed physics course. Kehler (1982) found significant differences between high and low critical thinkers and all areas of

academic achievement and ability. Most recently, Sattler (1987) did a study using WGCTA on students ranging between 18-56 years of age. This study found a significant and positive relationship between WGCTA scores and overall cumulative GPA of university undergraduate students. There appears to be substantial support for the present findings.

In direct contrast, a smaller body of research findings have indicated no significant relationship between critical thinking ability and academic performance. Arand and Harding (1987) conducted a study on 81 students enrolled in a baccalaureate program in physical therapy at a midwestern medical school, using the WGCTA. No significant relationship was found between the two. Other studies found the same to be true (Perkins, 1985; Rosen, 1986; and Williams, 1981).

One possible reason for this discrepancy in the literature might be attributed to design differences. Some designs addressed the relationships between WGCTA scores and an overall cumulative GPA, while others appear to address only the relationship with the grade in a specific course. Significant relationships between WGCTA scores and cumulative GPA would represent a broader experience of instructor teaching and testing strategies, while those with a one course GPA would indicate an unique instructor teaching and testing

strategy. Given that coursework will require varying levels and different aspects of critical thinking ability upon the teaching and testing strategies of individual instructors, the reason for the discrepancy in the literature becomes quite apparent.

Until this study, no previous studies were found that examined the contribution of each of the specific WGCTA subscales to overall cumulative GPA. The results seem to indicate that not all aspects of the ability to think critically contribute equally to overall academic performance. Although the abilities to accurately infer (Test 1), interpret (Test 4), and evaluate arguments were found to significantly correlate with cumulative GPA, only the abilities to infer (Test 1) and evaluate arguments (Test 5) were found to significantly ($p=.0000$) and uniquely contribute to 9.2% of the variance within cumulative GPA.

It is also important to note the gender differences which were found to exist in the present study. Findings appear to indicate that proficiency in only one skill (inference) associated with critical thinking is required for higher male student academic achievement, while proficiency in two different skills (deduction and evaluation of arguments) are required for higher female student academic achievement. Chong (1969) found similar results, however, only when academic status was

held constant. Simon and Ward (1974) reported a significantly higher performance on WGCTA for college males than females. In the present study, males only scored significantly higher than females on Test 4 (interpretation). These findings are more similar to the findings of the majority of research in the literature (Crawford, 1976; Curtis, 1980a; Gurfein, 1977; Harmon, 1983; Moll and Allen, 1982; Rocha, 1985; Sattler, 1987). Gender differences do not apparently exist to a significant extent in the most current writings addressing levels of ability in critical thinking. However, these findings do indicate that what is required for a male student to succeed academically is quite different than what is required for the female student, even in cases where ability levels are quite similar.

Implications

These findings clearly support the importance of instruction in critical thinking skills to increase the probability of academic success for all university students. However, results indicate that the ability to think critically is certainly not the only answer to academic achievement, given that only 9.2% of the variance within GPA can be attributed to critical thinking abilities. GPA is definitely influenced by more than one factor (i.e. motivation, goals and

personal skills) (Zimmermann, Goldstein, and Gadzella, 1977). It would appear important that instruction modules addressing the ability to think critically be at least included in student retention programs at all levels of education. Given that attrition for the overall university student population has remained consistent (50%) for the last two decades, it would seem that the addition of this intervention might increase the effectiveness of current retention programs.

Recommendation for Future Research

The present researchers have several recommendations to make for future research endeavors. First, longitudinal designs are encouraged. All freshmen would be given the WGCTA and subsequently at the beginning of each following year until graduation. Semester, annual, and cumulative GPAs and enrollment status would be noted throughout student tenure at the university. This strategy would address both academic performance and persistence. It would also assist in obtaining some understanding of the impact of university life upon the development of the ability to think critically.

Second, given the increase of cultural diversity within the population in this country, it would seem important that WGCTA scores be examined across cultures with GPA and persistence. If gender differences do

exist, there well may be racial/ethnic differences in skills to think critically that would significantly impact academic performance.

Conclusion

In today's society, the ability to think critically is considered important for individuals to become active and productive citizens. It is a way of enhancing a correct appropriate decision and of correcting errors and redirecting decisions. The study revealed results important to educators, program designers, evaluators, and counselors who are aiming and targeting the preparation of students, clients, or consumers to become citizens who will be prepared to develop a better future for tomorrow's world.

Table 1

Racial/Ethnicity Status	# of Participants Male	Female	Percentages Male%	Female%
Caucasian	94	116	89.5	89.9
African American	3	7	2.9	5.4
Asian American	_	3	_	2.3
American Indian	3	1	2.9	.8
Hispanic American	5	2	4.8	1.6

Academic Status	# of Participants Male	Female	Percentages Male%	Female%
Freshman	65	83	61.3	63.8
Sophomore	21	34	19.8	26.2
Junior	12	11	11.3	8.5
Senior	8	2	7.3	1.5

Table 2

Correlation Coefficients of Both the Overall Ability of Critical Thinking and its Components with Demographic Variable

	Sex	GPA
CTTEST 1	-.0073	.2755*
CTTEST 2	-.0410	.0613
CTTEST 3	-.0782	.2148
CTTEST 4	-.1788*	.1780*
CTTEST 5	.0281	.1285*
CT-ALL	-.0787	.2625*

* at .05 level of significance

Table 3

Multiple Regression with GPA as a Dependent Variable

Variable	Multiple R	R square	Overall F change	Overall F	Significant F
CTTEST 1	.3033	.09202	3.94	11.25	.0000
CTTEST 5					

CTTEST 2 (recognition of Assumptions, CTTEST 3 (deduction) and CTTEST 4 (interpretation) did not account for significant amount of the variance in GPA.

Table 4

Multiple Regreession with GPA as a Dependent Variable for Males

Variable	Multiple R	R square	F change	Overall F	Significant F
CTTEST 1	.346	.119	13.45	13.45	.0004

CTTEST 2 (recognition of assumptions, CTTEST 3 (deduction) and CTTEST 4 (interpretation), and CTTEST 5 (evaluation of arguments) were not found to be significant predictors of GPA.

Table 5

Multiple Regression with GPA as a Dependent Variable for Females

Variable	Multiple R	R square	F change	Overall F	Significant F
CTTEST 5 CTTEST 3	.3355	.1126	4.37	7.67	.0007

CTTEST 1 (inference), 2 (recognition of assumptions), and 4 (interpretation) did not ontribute to the variance accounted for in GPA.

References

Annis, Linda F., and Annis, David B. (1979). The impact of philosophy on students' critical thinking ability. Contemporary Educational Psychology, 4, 219-226.

Arand, J. U. and Harding, C. G. (1987). An investigation into problem-solving in education: A curricular framework. Journal of Allied Health, 16, n. 1, 7-17.

Begg, M. (1987). Teaching critical analysis writing using Stephen King's Danse Macabre. English Journal, 76(3), 72-74.

Beyer, B. K. (1987b). Planning thinking-skills curriculum--Key questions for principals to consider. NASSP Bulletin, 71(501), 101-112.

Brown, Sallie. (1987). Three methods to teach thinking skills. Social Studies Review, 26, n. 2, 59-62.

Browne, M. N. and Litwin, J. L. (1987). Critical thinking in the sociology classroom: Facilitating movement from vague objectives to explicit achievement. Teaching Sociology, 15, n. 4, 384-391.

Byrne, Michael and Johnstone, Alex. (1987). Critical thinking and science education. Studies in Highest Education, 12, n. 3, 325-339.

Cabrera, George Albert. (1982). Evaluating the teaching of critical thinking in content areas. (Doctoral Dissertation, Syracuse University). Dissertation Abstracts International, 43, n. 9,m 2959-A.

Caissy, Gail. (1986). Developing curriculum for the information age: How should education change to meet future needs. Education Canada, 26, n. 2, 21-25.

Chong, E. C. F. (1969). Norms and correlates of the Watson-Glaser Critical Thinking Appraisal and selected variables for Negro College students. (Doctorate Dissertation, University of Oklahoma).

Crawford, Jonathan Andrew. (1976). An investigation of the transfer of critical thinking skills from language arts to social studies. Doctoral Dissertation, Univ. of Wyoming, Laramie-Wyoming.

Curtis, Charles K. (1980). Developing critical thinking skills in nonacademic social studies classes. Alberta Journal of Educational Research, 26, n. 2, 75-84.

Donald, Janet G. (1985). Intellectual skills in higher education. The Canadian Journal of Higher Education, 15, n. 1, 53-68.

Elrod, Janelle Abercrombie. (1979). A study of teachers' frequency of oral expression of logic and

critical thinking ability and their relationship to students' geometry achievement and critical thinking ability. (Doctoral Dissertation, Auburn University). Dissertation Abstracts International, 39, n. 12, 7202-A.

Freie, John F. (1987). Thinking and believing. College Teaching, 35, n. 3, 89-91.

Furedy, John and Furedy, Christine. (1979). Course design for critical thinking. Improving College and University Teaching, 27, n. 3, 99-101.

Garett, Kenneth. (1978). The relationship between critical thinking ability, personality, and academic achievement of graduate students in the school of education at the University of Southern California. Dissertation Abstracts International, 33, n. 12.

Garett, Kenneth and Wulf, Kathleen. (1978). The relationship of a measure of critical thinking ability to personality variables to indicators of academic achievement. Educational and Psychological Measurement, 38, 1181-1187.

Garver, E. (1986). Critical thinking, them, and us: A response to Arnold B. Arons's 'critical thinking' and the Baccalaureate curriculum. Liberal Education, 72(3), 245-249.

Glaser, Edward M. (1985). Critical thinking: Educating for responsible citizenship in a democracy. Phi Kappa Phi Journal, 65, n. 1, 24-27.

Gough, Pauline B. (1979). Teaching Thinking by Television. Educational Leadership, 36, n. 3, 561-565.

Gurfien, H. (1977). Critical thinking in parents and their adolescnet children. Dissertation Abstracts International, 174-A.

Harmon, Saundra Bryn. (1983). Effects of instruction in critical reading and/or critical viewing skills on critical thinking. Dissertation Abstracts International, 44, n. 3, 657-A.

Harris, Judy. (1986). Japanese Summer: Journal excerpts for classroom use. Southern Social Studies Quarterly, 12, n. 2, 35-48.

Keeley, S. M. and Browne, M. N. (1978). Issues and trends in American education, improving student evaluation forms: Related need for critical emphasis and trained raters. Peabody Journal of Education, 55, n. 4, 305-308.

Kehler, Marietta Triece. (1982). The effects of a program for gifted high school students on critical thinking and the association of this variable to intelligence, sex, academic achievement, and teachers' ratings of behavioral characteristics.

Dissertation Abstracts International, 43, n. 3, 756-A.

Landis, Richard E., and Michael, William B. (1981). The factorial validity of three measures of critical thinking within the context of Guilford's structure-of-intellect model for a sample of ninth grade students. Educational and Psychological Measurements, 41, 1147-1166.

Little, Thomas Lee. (1972). The relations of critical thinking ability to intelligence, personality factors and academic achievement. (Doctorate Dissertation, Memphis State University). Dissertation Abstracts International, 33, 5544-A.

Mckinnon, Joyce Leslie. (1987). relations among patient management problems, critical thinking abilities and professional knowledg levels attained by physical therapy students. Doctoral Dissertations, North Carolina State University). Dissertation Abstracts International, 48, n. 6, 1441-A.

Moll, Michael B., and Allen, Robert D. (1982). Developing critical thinking skills in biology. Journal of College Science Teaching, 12, n. 2, 95-98.

Morante, Edward A. and Ulesky, Anita. (1984). Assessment of reasoning abilities. Educational Leadership, 42, n. 1, 71-74.

Nelson, Jack. (1987). Critical thinking in social education: The genocide example. Social Science Record, 24, 60-62.

Norris, Stephen. (1985). Synthesis of research on critical thinking. Educational Leadership, 42, 40-45.

O'Reily, Kevin. (1985-86). Spotlight on critical thinking. The New England Social Studies Bulletin, 43, n. 2, 31-33.

Perkins, Harvey William. (1985). the effects of microcomputer use on the critical thinking skills of middle school students. (Doctorate Dissertation, The College of William and Mary in Virginia). Dissertaion Abstracts International, 46, n. 1, 131-A.

Petulla, Joseph M. (1985). Professional standards in environmental management. The Enviromental Professional, v. 7, p. 194-198.

Primack, Robert. (1985-1986). No substitute for critical thinking: A response to Wynne. Educational Leadership, 43, N. 4, 12-13.

Proefriedt, William. (1978). Reading, writing, and philosophy. The Social Studies, 69, n. 6, 249-252.

Rocha, Alice Perez. (1985). The effects of training in problem solving on the critical reading skills of high school seniors. (Doctorate Dissertation, University of Missouri-Saint Louis). Dissertation Abstracts International, 46, n. 8, 2249-A.

Rosen, Louis Emanuel. (1986). The effect of critical thinking skills upon content learning of low-ability adolescents (Doctorate Dissertation, Claiemont Graduate School). Dissertation Abstracts International, 47, n. 3, 841-A.

Ryder, Nancy M. A. (1986). Philosophy for children: a history of an innovation. Dissertation Abstracts International, 47, no. 03, 778-A-779-A.

Sattler, Diana M. (1987). Programming in Basic or Logo-Effects on critical thinking skills. Doctorate Dissertation, University of New Mexico, Albuquerque, New Mexico.

Sharp, Ann Margaret. (1987). What is a 'community of inquiry.' Journal of Moral Education, 16, n. 1, 37-45.

Siegel, Harvey. (1980). Critical thinking as an educational ideal. Educational Forum, 45, n. 1, 7-23.

Siegel, Harvey. (1987). Rationality and ideology. Educational Theory, 37, n. 2, 153-167.

Simon, A., and Ward, L. O. (1974). The performance on the Watson Glaser Critical Thinking Appraisal of University Students Classified According to Sex, type of course pursued, and personality score category. Educational and Psychological Measurement, 34, 957-960.

Sperry, Joseph W. (1976, 1980). Computer situations and critical thinking in high school biology. (Doctorate Dissertation, University of Utah). Dissertation Abstraccts International, 37, n. 9, 5730-5731-A.

Steele-Hanson, Alma M. (1986). Critical thinking of novice and expert computer programmers. (Doctoral Dissertation, University of Idaho). Dissertation Abstracts International, 47, n. 8, 2916-A.

Strahan, David B. (1986). Guided Thinking: A research-based approach to effective middle grades instruction. Clearing House, 60, n. 4, 149-155.

Tanner, Stephen L. (1986). Education by criticism. English Journal, 75, n. 6, 22-26.

Tilson, Elwin R. (1986). The effect of computers enhanced skill training in critical thinking and cognitive monitoring on learning and development of critical thinking in undergraduate family nursing courses. (Doctoral Dissertation, University of

Georgia). Disserttion Abstracts International, 47, n. 12, 4283-A.

Vandergrift, Kay E. (1987). Critical thinking misfired: Implications of student responses to the shooting gallery. School Library Media Quarterly, 15, n. 2, 86-91.

Walters, Kerry S. (1987). Critical thinking and the danger of intellectual conformity. Innovative Higher Education, 11, n. 2, 94-102.

Watson, G. and Glaser, E. (1980). Watson-Glaser Critical Thinking Appraisal: Manual. The Psychological Corporation, a subsidiary of Harcourt Brace Jovanovich, Inc. (U.S.A).

Williams, James Melford. (1981). A comparison study of the effects of inquiry and traditional teaching procedures on student attitude, achievement, and critical-thinking abilities in eleventh grade United States History. (Doctorate Dissertation, Auburn University, Alabama). Dissertation Abstracts International, 42, n. 4, 1605-A.

Wilson, Marilyn. (1988). Critical thinking: Repackaging or revolution? Language Arts, 65, n. 6, 543-551.

Wilson, Diane Grimard and Wagner, Edwin E. (1981). The Watson-Glaser Critical Thinking Appraisal as a predictor of performance in critical thinking

course. Educational and Psychological Measurement, 41, n. 4, 1319-1323.

Wolf, Dennis Palmer. (1987). The Art of Questioning. Academic Connections.

Young, Mildred Crymes. (1986). An elementary literature program: A design for enhancing reading achievement. Doctorate Dissertation, University of Georgia.

Zimmerman, M. L., Goldstein, T. J. and Gadzella, B. M. (1977). Prediction of academic performance for collete students by sex and race. Psychological Reports, 41, 1183-1186.